

Policy and Doctrine Impacts of Semi & Full Autonomous ISR & Weaponized RPA  
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*“We have just won a war with a lot of heroes flying around in planes. The next war may be fought by airplanes with no men in them at all.”<sup>1</sup>*

General Hap Arnold, VJ Day, 1945

Remotely Piloted Aircraft (RPA) have performed a myriad of missions in their brief service history--from initial Intelligence Surveillance Reconnaissance (ISR) support operations in the Balkans to performing kinetic strike missions in today's counterterrorism struggle. Innovative mission sets are continually being introduced such as RPA airborne communication data relays.<sup>2</sup> The revolutionary capabilities that RPA deliver have not been without problems, namely in the realm of Command and Control (C2), the sheer variety of RPA operations, and in the acquisition process. Despite this, RPA are here to stay--their numbers have increased from an estimated 167 in 2003 to 5331 in 2008 with the trend expected to continue.<sup>3</sup> This reason alone warrants a closer examination of policy and doctrinal impacts with a particular focus on autonomous RPA ops. However, the lack of current policy and doctrine for RPA operations, which are overwhelmingly non-autonomous (i.e., man-in-the-loop), does not bode well in moving toward a possible future where RPA will be operating autonomously.<sup>4</sup> Thus, defining current joint policy and doctrine is imperative in laying the foundation for better RPA C2, operations, acquisitions and a future with autonomous RPA.

One of the impediments in laying a common framework or doctrine is the variety of RPA operations. The services use of RPA is viewed from different mindsets, and doctrine adherents would argue that “RPA operations are alien to traditional aviation operations.”<sup>5</sup> The Army and Air Force appear to be at odds over the role of RPA operations. The Army views its Warrior RPA system, a Predator variant, as a hunter-killer with the capability to perform both

ISR and attack missions.<sup>6</sup> Additionally, the Warrior can be configured for exclusive ISR or kinetic operations; alternatively, the USAF views ISR operations as the RPA's primary mission due to its significant loiter time over the battlefield.<sup>7</sup>

Unsurprisingly, the variety of operations RPA are capable of has increased their workload. Ongoing operations in USCENTCOM are testament to this claim. During a recent engagement in Afghanistan, Gen McChrystal restricted air strikes on a village that was giving fire to a US ground force.<sup>8</sup> The idea here was to let the enemy fighters escape the village, and subsequently monitor the enemy via RPA rather than attack, then alienate the villagers whose support is arguably the center of gravity in any counterinsurgency campaign--i.e., the winning of hearts and minds.<sup>9</sup> In nearby Pakistan, CIA operated RPA are the best asset available to counter insurgents rather than a coalition ground incursion or manned overflight and the associated diplomatic difficulty in dealing with Pakistan.<sup>10</sup>

The relatively permissive air environment in both Iraq and Afghanistan has enabled a tremendous amount of RPA operations. This condition does not impose a sense of urgency to instill more rigorous Command and Control (C2) for RPA operations. There is simply no credible counterair threat in either Iraq or Afghanistan. With a possible future enemy operating in the air or attempting to jam air vehicle communications, rigorous C2 will be required beyond the current practice of merely including some RPA activity in the ATO. A more capable enemy such as Iran or China could asymmetrically negate some of the advantages we enjoy. Acquisition and doctrine development needs to be aware of and account for this possibility.

Complicating RPA C2 further is the different RPA operational paradigms between the services. The USAF has argued that the Warrior RPA can have theater wide effects; thus, from a

resource optimization perspective, it is not efficient to tie a Warrior to a specific ground unit as is current practice in the US Army.<sup>11</sup> Assigning aircraft to specific ground units has precedent in both WW II and Vietnam, and served as a major impetus in the creation of a Joint Force Air Component Commander (JFACC)--having airmen in charge of airmen and maximizing the effects of airpower across the joint operational area.<sup>12</sup> This argument is supported from a USAF doctrine perspective, but the Army would probably counter it has made the entire investment in the Warrior acquisition to fill capability shortfalls in its own inventory.<sup>13</sup> Furthermore, the Army will insist that it may not receive the CAS and persistent ISR effects if the Warrior is ‘taken’ from it and reassigned to the JFACC for better resource management and command & control. Lt Gen Deptula, HAF/A2, suggests that the Joint Force Commander should manage assets that produce theater-wide effects.<sup>14</sup> In such a scenario, the JFC would probably delegate overall RPA C2 to the JFACC for the same reason manned aircraft are managed at the theater level by the JFACC--because those assets can achieve theater-wide effects, and the JFACC can manage a large air campaign.

As the innovative employment of RPA increases, this will only continue to stress the C2 systems currently in place that were not designed for RPA operations. Via enhanced ground control and altitude separation, a new multi-ship formation tactic is emerging that allows RPA to provide full-motion-video from multiple RPA (multiple views) and subsequently engage multiple targets.<sup>15</sup> A ‘buddy-lase’ tactic is also emerging that calls for one RPA to lase a target whilst another RPA engages it.<sup>16</sup> These examples reinforce the idea that RPA are able to “redefine the manner in which airpower solves tactical problems.”<sup>17</sup> RPA have enabled a new concept known as armed overwatch in which RPA provide cover for a maneuver unit.<sup>18</sup> The multi-ship RPA formation tactic is being used to overcome the ‘soda-straw affect’ to expand

fields of view beyond that of a one ship RPA.<sup>19</sup> The innovative tactics being employed across the services bode well for a future battlespace dominated by RPA, but will continue to stress the C2 architecture in place. It would certainly be easier in getting to that future with joint doctrine to guide C2, tactics development and acquisition.

As expected, bandwidth usage has increased as the number of RPA operating in the theater has gone up. Bandwidth is a fixed commodity, and with RPA C2 allocated to several organizations it is not optimally managed.<sup>20</sup> In the future, we may approach the limits of this fixed amount of bandwidth as RPA continue to proliferate across the battlespace.<sup>21</sup> Centralized control of RPA operations would place bandwidth management into the hands of a single organization vice allocation amongst the services and other organizations--thereby streamlining bandwidth management and hopefully achieving more data throughput.

For these reasons, the USAF has argued that current manned aircraft doctrine and a precedent of successful 'air operations management' by a JFACC mandates more rigorous Command and Control (C2) of medium to high altitude RPA. This belief is in accordance with Air Force Doctrine Document 1 which states, "Centralized C2 of air and space forces under a single airman is a fundamental principle of air and space doctrine."<sup>22</sup> The establishment of a JFACC has borne fruit since its debut in the Gulf War. Airpower was separated amongst ground units and thus not employed effectively in the Vietnam War. Currently, USMC and USN airpower is not 'owned' by the JFACC. Instead, USMC and USN liaisons on the JFACC's staff at the Air Operations Center coordinate, de-conflict and integrate their own airpower activities within the framework of the Air Tasking Order process. An adaptation of this approach is recommended for enhanced RPA C2. This may be as simple as virtual or real liaison officers

embedded in the AOC. The precedent and processes are in place. And in the case of USN and USMC airpower, those services still execute day-to-day taskings of their airpower assets.

In light of the C2 issues discussed above and the ongoing debate about what unmanned systems can and cannot do compared against what manned systems can do, it would appear the need for joint doctrine would be self-evident.<sup>23</sup> However, Joint Publication 3-55.1: *Joint Training, Tactics and Procedures for UAVs*, was rescinded “because service planners agreed that UAV doctrine should be disseminated in mission oriented publications, rather than those focused on UAVs.”<sup>24</sup> This short-sighted decision requires re-examination in light of the debate on all the issues involved with the proliferation of RPA--C2, operations, and acquisitions. Indeed doctrine could lay the foundation to build sound acquisition programs and avoid duplication of effort as is occurring right now. A joint-wide paradigm for RPA ops, captured in joint doctrine, could help solve acquisition problems and thereby save money in the acquisition process.

In the RPA acquisition and procurement process, there have been instances of both very good cooperation and little to no cooperation in services’ attempts to work together to achieve efficiencies (i.e., cost reduction) when the RPA share commonalities. On their own initiative, the Army Fire Scout Program Office worked with their counterparts in the Navy to achieve significant performance and design commonality that yielded an approximate \$200M savings.<sup>25</sup> On the other hand, the Army awarded its Warrior RPA contract to the same contractor as the Air Force’s Predator, and a GAO team concluded that the Warrior and Predator designs have 80% in common.<sup>26</sup> The different subsystems between the Air Force and Army RPA could have simply been swapped out under one consolidated contract vehicle, thereby achieving cost efficiencies. Additionally, the GAO report suggested that the ultimate cause of the two services not collaborating on the development effort stems from the services different concept of

operations.<sup>27</sup> The Air Force uses rated pilots, the Army relies on technicians and automated takeoff and landing; additionally, the Army uses direct line-of-sight (LOS) communications whereas the Air Force uses beyond LOS.<sup>28</sup> It is unknown why the Army chose not to work with the Air Force on this acquisition. Perhaps the Army felt that the USAF, seeking a role as executive agent for RPA at the time, would not be amenable to the US Army's planned RPA use, which represented a significant departure from its own CONOPs. It would appear that a Joint RPA doctrine would lay the foundation for a myriad of RPA missions and tactics.

This belief and others prompted a 5 Mar 07 memorandum from the CSAF to Deputy Secretary of Defense England and the Joint Chiefs proposing the USAF serve as executive agent for UAVs operating higher than 3,500 feet.<sup>29</sup> Inherent in the role as executive agent is the belief the USAF can best meet the development, standardization, and procurement needs of the Joint warfighter, thus enabling increased combat capability.<sup>30</sup> This proposal was rejected on the grounds that OSD should manage acquisition activities that are occurring across the services. In addition, Mr. England directed an interagency task force be organized to promote interoperability and efficient RPA operations.<sup>31</sup> With the lack of joint doctrine, overarching RPA guidance and the problems outlined in this paper, it would appear that this task force has had little success so far.

Complicating matters for the USAF is the fact that "Predator and Global Hawk were technology demonstrators forced on to the Air Force by OSD and Reaper was a company-developed Predator derivative."<sup>32</sup> The fact that the USAF doesn't have extensive experience in RPA acquisitions doesn't bode well for the service that would appear to be a natural fit to lead such activity. This shortcoming served as one contributing factor in the USAF's creation of the RPA flight plan which will be discussed next.

On May 18, 2009, the USAF released its Unmanned Aircraft Systems Flight Plan for 2009-2047 which partially addresses some of the issues previously discussed. Additionally, it outlines a capabilities-based portfolio and charts out actions under the auspices of Doctrine, Organization, Training, Materiel, Leadership and Education, Personnel, Facilities and Policy recommendations.<sup>33</sup> The plan acknowledges a possible future with RPA acting autonomously and calls for non-rated pilots serving as RPA ‘fliers’--in fact the USAF currently has a non-rated RPA pilot Beta program to test the feasibility of using non-rated RPA operators.<sup>34</sup> Additionally, the Flight Plan acknowledges a future with autonomous RPA in the entire kill Find, Fix, Track, Target, Engage Assess chain enabled by artificial intelligence.

This RPA Flight Plan is a step in the right direction for the USAF. It’s an acknowledgement that USAF leadership is finally getting very serious about RPA and acknowledging that the RPA are the future--indeed they’ve already arrived. It is unfortunate that this Flight Plan debuted a full 2 years after USAF leadership requested RPA executive agency--the Flight Plan should have preceded the request for executive agency as it would have bolstered credibility to the request. Embroiled in the F-22 controversy and later with the Barksdale-Minot unauthorized nuclear weapons movement, the USAF’s political capital was not ripe for being rewarded with increasing mission sets at the perceived expense of the other services. Specifically with RPA, the popular perception was that the USAF was a reluctant player in embracing these unmanned technological wonders. With a fighter pilot cultural legacy, the idea of unmanned flight was anathematic to many in the USAF. Certainly the fact that the Predator and Global Hawk technology demonstrators were forced upon the USAF by OSD reinforces that opinion. Times have changed, and it appears that the USAF has a completely different RPA mindset as embodied in the Flight Plan. If not the USAF, who is better equipped to lead RPA

acquisition, doctrine, and policy for the DoD? The well-thought, comprehensive RPA flight plan makes it clear that the USAF is best equipped to lead the DoD into a future with RPA at the forefront.

This brief overview of major RPA issues only touches the surface of a problem that will probably require great effort to solve, namely RPA ‘optimization’. However, it is certain that RPA are here to stay and the fact that all of the services are working hard to field more of them is testimony to the vast array of mission sets they can perform successfully. They have been fielded to fill capability gaps in the current manned aircraft inventory (e.g., persistent ISR, responsive CAS). The 3000% increase in the number of fielded RPA from 2003 to 2008 is positive proof that RPA, with their long loiter time and kinetic capabilities, are essential in today’s counterinsurgency fight. Joint doctrine for RPA would enable better acquisitions and better operations now and in the future with the USAF leading the way. Future use of RPA serving as air-to-air combat vehicles is a possibility, as Secretary Gates indicated when he stated that the F-35 will be the last manned fighter.

At least 40 countries currently fly RPA--they are inexpensive, and built primarily from commercially off-the-shelf components.<sup>35</sup> If the US doesn’t stay at the forefront of RPA development, someone else will beat us to it. The words of General Omar Bradley are appropriate: “If we continue to develop our technology without wisdom or prudence, our servant may prove to be our executioner.”<sup>36</sup> The overall experience with RPA to date thus can be characterized as inconsistent, of varying commitment and effort, redundant, and lacking in overall guidance. The time is ripe to fix this problem and lay a foundation for better RPA development and doctrine with the USAF leading the way.

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- <sup>1</sup> Brian Mockenhaupt, We've Seen the Future and It's Unmanned, *Esquire Magazine*, November 2009
- <sup>2</sup> Carson Kit, Industry Outlook, *Aviation Week and Space Technology*, Volume 168, Issue 3, 14
- <sup>3</sup> Tom Vanden Brook, "Report: Insurgents Benefit from Drone Shortage," *USA Today*, 25 March 2008, [http://www.usatoday.com/news/world/iraq/2008-03-24-UAV\\_N.htm](http://www.usatoday.com/news/world/iraq/2008-03-24-UAV_N.htm) (accessed 28 Oct 09)
- <sup>4</sup> Keith Alford and Knight, Russell, UAVs Need a Better Roadmap, *US Naval Institute Proceedings*, January 2004, Vol 130, Issue 1, pg 77
- <sup>5</sup> William H. Johnson, UAVs Need Doctrine & Tactics, 37
- <sup>6</sup> Courtney E. Howard, Hunter-Killer UAVs to Swarm Battlefield, *Unmanned Vehicles Supplement for Military and Aerospace Electronics*, July 2007
- <sup>7</sup> *Ibid.*, 2-6
- <sup>8</sup> Brian Mockenhaupt, We've Seen the Future and It's Unmanned, *Esquire Magazine*, November 2009
- <sup>9</sup> Michael Walzer, *Just and Unjust Wars*, pg 186
- <sup>10</sup> Brian Mockenhaupt, We've Seen the Future and It's Unmanned, *Esquire Magazine*, November 2009
- <sup>11</sup> John T. Bennett, Lt Gen David Deptula Interview, *Defense News*, 12 Jan 09
- <sup>12</sup> Rebecca Grant, The Clash of the UAV Tribes, *Air Force Magazine*, September 2005, 46
- <sup>13</sup> Air Force Doctrine Document 2, 46-51
- <sup>14</sup> John T. Bennett, Lt Gen David Deptula Interview, *Defense News*, 12 Jan 09
- <sup>15</sup> Capt Steven Mwesigwa, USAF, Predator and Reaper Advancement in Combat Capabilities, *Air Land Sea Bulletin*, Issue No. 2009-3, September 2009, 4-5
- <sup>16</sup> *Ibid.*, pg 5
- <sup>17</sup> Maj Bryan Callahan, USAF Theater Unmanned Aircraft: Lessons Learned from the 26<sup>th</sup> Weapons Squadron, USAF Weapons School, *Air Land Sea Bulletin*, Issue No. 2009-3, September 2009, pg 10
- <sup>18</sup> *Ibid.*, pg 11
- <sup>19</sup> *Ibid.*, pg 11
- <sup>20</sup> J.R. Wilson, Hunter-Killer UAVs to swarm battlefields, *Military & Aerospace Electronics*, July 2007, pg 3
- <sup>21</sup> Robert S. Dudley, A Better UAV Flight Plan, *Air Force Magazine*, April 2007, 2
- <sup>22</sup> Air Force Doctrine Document 1, pg 50
- <sup>23</sup> Geoff Fein, DoD Closely Examining Roles And Implications of UAVs, *Defense Daily*
- <sup>24</sup> Keith Alford and Knight, Russell, UAVs Need a Better Roadmap, *US Naval Institute Proceedings*, January 2004, Vol 130, Issue 1, pg 77
- <sup>25</sup> United States Government Accounting Office, *Defense Acquisitions: Greater Synergies Possible for DoD's Intelligence, Surveillance and Reconnaissance Systems*, 13
- <sup>26</sup> *Ibid.*
- <sup>27</sup> *Ibid.*
- <sup>28</sup> *Ibid.*
- <sup>29</sup> United States Air Force Portal, *Officials Discuss Executive Agency for UAVs*, 15 Apr 07, <http://www.af.mil/news/story.asp?id=123048908>, accessed 8 Nov 09
- <sup>30</sup> *Ibid.*
- <sup>31</sup> Amy Butler, Deputy Defense Secretary Kills USAF UAV Takeover, *Aerospace Daily & Defense Report*, 17 Sep 07, [http://www.aviationweek.com/aw/generic/story\\_generic.jsp?channel=aerospacedaily&id=news/UAV09177.xml](http://www.aviationweek.com/aw/generic/story_generic.jsp?channel=aerospacedaily&id=news/UAV09177.xml), accessed 30 Nov 09
- <sup>32</sup> Amy Butler, Graham Warwick, Autonomous Futures, *Aviation Week and Space Technology*, 47
- <sup>33</sup> Headquarters, United States Air Force, *United States Air Force Unmanned Aircraft Systems Flight Plan*, May 18, 2009, pg. 3
- <sup>34</sup> *Ibid.*, pg. 16, 28
- <sup>35</sup> Brian Mockenhaupt, We've Seen the Future and It's Unmanned, *Esquire Magazine*, November 2009
- <sup>36</sup> Thomas K. Gainey, Director's Comments, *Air Land Sea Bulletin*, Issue No. 2009-3, September 2009, 3

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